ACCESSION #: 9604010335

LICENSEE EVENT REPORT (LER)

FACILITY NAME: Browns Ferry Nuclear Plant (BFN) Unit 3 PAGE: 1 OF 7

DOCKET NUMBER: 05000296

TITLE: The reactor scrammed after an APRM high flux scram signal

occurred because of a partial closure of the turbine

control valves due to a faulty EHC frequency/voltage

converted card. This scram resulted in ESF actuations.

EVENT DATE: 2/29/96 LER #: 96-001-00 REPORT DATE: 03/26/96

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: N POWER LEVEL: 99.9

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:

50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: James E. Wallace, Compliance TELEPHONE: (205) 729-7874

Engineer

COMPONENT FAILURE DESCRIPTION:

CAUSE: X SYSTEM: JJ COMPONENT: CNV MANUFACTURER: G080

REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On February 29, 1996, at 0158 hours, Browns Ferry Unit 3 was operating at 99.9 percent power and Unit 2 at approximately 94 percent power when the Unit 3 reactor scrammed after receiving a high APRM neutron flux signal. The reactor scram followed a pressure

transient when the output of the Electric Hydraulic Control (EHC) frequency/voltage converter (FVC) card associated with the speed control drifted to a setting that created a demand to ramp down the turbine control valves. These conditions resulted in engineered safety feature (ESF) actuations. Therefore, this event is reportable pursuant to 10 CFR 50.73(a)(2)(iv), as any event or condition that resulted in manual or automatic actuation of any ESF including the reactor protection system. The cause of this event resulted from a faulty turbine speed control EHC FVC card. The immediate corrective action was to bring the reactor to a stable condition. The faulty card was replaced. TVA plans to send the faulty card to the vendor for further investigation. Any additional corrective actions that are developed as a result of the vendor's investigation will be implemented in accordance with TVA's corrective action process. There was a previous LER (260/94005) that resulted from an EHC system malfunction; however, corrective actions taken in LER 260/94005 would not have precluded this event.

TEXT PAGE 2 OF 7

I. PLANT CONDITIONS

At the time of this event, Unit 3 was operating at 99.9 percent

power and Unit 2 at approximately 94 percent power. Unit 1 was

shutdown and defueled. At the time of the event, no testing,

maintenance or major evolutions were in progress.

II. DESCRIPTION OF EVENT

A. Event

On February 29, 1996, the reactor experienced a scram that

resulted after receiving a high Average Power Range Monitor

(APRM) [MON] neutron flux signal. This scram signal followed a

pressure transient after a partial closure of the turbine

control valves [FCV] due to a faulty EHC [JJ] frequency/voltage

converter (FVC) card [CNV].

Specifically, the output of the Electro Hydraulic Control (EHC)

FVC card [See Attachment 1] associated with the speed control

drifted to a setting that simulated an overspeed condition, which created a demand for the turbine control valves to ramp down to a 25 percent open position. As the control valves were ramping down, nine (9) bypass valves [JI] opened to reduce the impact of an increase in pressure. The bypass valves began to close when the pressure demand decreased. However, as the control valves continue to close to the 25 percent open position, the pressure began to increase. The reactor pressure reached a maximum of 1032 psig. The increase pressure caused the primary system steam voids to collapse, thus, creating high APRM neutron flux condition. Based on this condition, the reactor protection system actuated and the control rods [AA] inserted.

The scram caused actuation or isolation of the following Primary Containment Isolation System [JE] (PCIS) systems/components.

o PCIS group 2, Shutdown cooling mode of Residual Heat Removal [BO]; Drywell floor drain isolation valve and Drywell equipment drain sump isolation valve [WP].

o PCIS group 3, Reactor water Cleanup [CE).

o PCIS group 6, Primary Containment Purge and Ventilation [JM]; Reactor Zone Ventilation [VB]; Refueling Zone Ventilation [VA]; Standby gas Treatment (SGT) [BH] system;

and Control Room Emergency Ventilation (CREV) [VI].

o PCIS group 8, Transverse Incore Probe [IG] withdrawal.

At 0159 hours, the main turbine [TA] was manually tripped by the Unit Operator (utility, licensed).

At 0208 hours, Unit 3 was stabilized in accordance with 3-AOI-100-1, "Reactor Scram," and the affected systems were returned to standby readiness. All systems responded as expected during the scram.

The event is reportable pursuant to 10 CFR 50.73(a)(2)(iv) as a condition that resulted in the manual or automatic actuations of any Engineered Safety Feature (ESF) including the reactor protection system (RPS).

B. Inoperable Structures, Components, or Systems that Contributed to the Event:

The faulty turbine speed control EHC FVC card (model number 115D3332 G1) was manufactured by General Electric Company.

C. Dates and Approximate Times of Major Occurrences:

February 29, 1996 at 0158 CST The Unit 3 reactor control rods inserted based on an RPS actuation (high APRM neutron flux)

February 29, 1996 at 0159 CST The main turbine was tripped

manually.

February 29, 1996 at 0208 CST The PCIS actuations were reset.

SGT and CREV systems are returned

to standby readiness.

February 29, 1996 at 0425 CST TVA made a 4-hour nonemergency

notification to NRC in accordance

with 10 CFR 50.72 (b)(2)(ii).

D. Other Systems or Secondary Functions Affected:

None.

E. Method of Discovery:

The Unit 3 Control Room Operator [utility, licensed] received a

high APRM neutron flux alarm. This alarm was followed by

additional alarms associated with a full-power reactor scram.

F. Operator Actions:

Operator actions taken during this event were as expected.

PCIS groups, SGT system, and CREV system were verified to have

performed as expected. The Unit 3 scram was reset. The Unit 3

Operator initiated abnormal operations instruction

(3-AOI-100-1) to ensure that the affected systems were brought

to standby readiness.

G. Safety System Responses:

None.

III. CAUSE OF THE EVENT

A. Immediate Cause:

The immediate cause of this event was the partial closure of the Unit 3 turbine control valves that caused an increase of reactor pressure and resulted in an automatic scram after a high reactor flux alarm was received.

B. Root Cause:

This event resulted from an unexpected and random equipment failure, specifically, a faulty turbine speed control EHC FVC card. The faulty card simulated a turbine overspeed condition and created a demand signal to ramp down the turbine control valves (from 54 percent open to 25 percent open) and to open the bypass valves (reducing the impact of the control valves closing). Some bypass valves cycled as the turbine control valves ramped down. However, the reactor pressure continued to increase, and a high APRM neutron flux condition was sensed.

IV. ANALYSIS OF THE EVENT

The throttling (closure to the 25 percent position) of the turbine control valves is similar but less severe than a previously analyzed event, Generator Load Rejection Without Bypass (GLRWB). In the BFN Unit 3 Cycle 7 Supplemental Reload Licensing Report, fast closure of the main turbine control valves is analyzed assuming that the Bypass valves fail to open, resulting in a pressure transient. During this

LER event, the reactor experienced an increase of less than 30 psig in about 4 seconds. In the GLRWB event, the reactor vessel pressure increases by more than 150 psig in about 2 seconds. Therefore, this LER event is clearly bounded by the previous analysis, and the Safety Limit MCPR was not challenged.

V. CORRECTIVE ACTIONS

A. Immediate Corrective Actions:

Immediate corrective action was to manually trip the main turbine and to bring the reactor to a stable condition in accordance with site procedure 3-AOI-100-1.

B. Corrective Actions to Prevent Recurrence:

During the troubleshooting of the EHC circuitry, it was revealed that a faulty FVC card associated with the turbine speed control circuitry was malfunctioning. The faulty card was replaced and the replacement card was successfully tested. TVA plans to send the faulty card to the vendor to perform a failure analysis of the EHC FVC card. Any additional corrective actions that are taken as a result of the vendor's investigation will be incorporated in BFN's corrective action program (BFPER960169). 1_/

VI. ADDITIONAL INFORMATION

A. Failed Components:

The faulty turbine speed control EHC FVC card (model number 115D3332 G1) was manufactured by General Electric Company.

B. Previous LERs on Similar Events:

One previous LER (260/94005) resulted from an EHC system malfunction. This previous LER's root cause was a failed EHC pressure regulator setpoint potentiometer. However, in this LER (296/96001) the failed component was not a regulating potentiometer in the pressure control circuitry. Therefore, no corrective actions taken in the previous LER would have precluded this event.

1_/ These additional corrective actions are considered as enhancements and are not commitments.

VII. COMMITMENTS

None.

Energy Industry Identification System (EIIS) system and component codes are identified in the text with brackets (e.g., [XX]).

ATTACHMENT 1 "EHC CONTROL SYSTEM" omitted.

*** END OF DOCUMENT ***